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Patentanmeldung Nr. Patent application No. Demande de brevet n°

99250139.5

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Blatt 2 der Bescheinigung
Sheet 2 of the certificate
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TRICKPLAY SUPPORT PROPOSAL

The invention relates to an improved trickplay support concept for a data stream recorder, in particular a DVD based data stream recorder.

This proposal describes a way to realize Access Units (AU). The resulting AUs have a resolution range from "2 SOBUs" up to "application packet" exact. The precision depends on the used DVD Streamer, i.e. whether the DVD Streamer knows the application and how much RAM memory is available and so on. With other words: the precision is manufacture matter.

Principle

Each SOB contains its own AU data (AUD). This AUD consists of a general information, one or two coarse lists and one or two fine lists.

The coarse list is called the Access Unit Start Map (AUSM). The AUSM consists of N flags (N is the number of SOBUs of this SOB). Each flag belongs to one SOBU. The flag indicates

- into the corresponding SOBU or into the next SOBU points an AU
- no corresponding AU exists for that flag

The fine list is called the Access Unit Location List (AULL). The AULL contains the application packet exact locations of all AUs. For each AU indicating AUSM/AUEM flag exists one location information inside AULL. Two kind of AULLs exist:

The part inside AULL which contains the start location is called the Access Unit Start Location List (AUSLL).

The part inside AULL which contains the end location is called the Access Unit End Location List (AUELL).

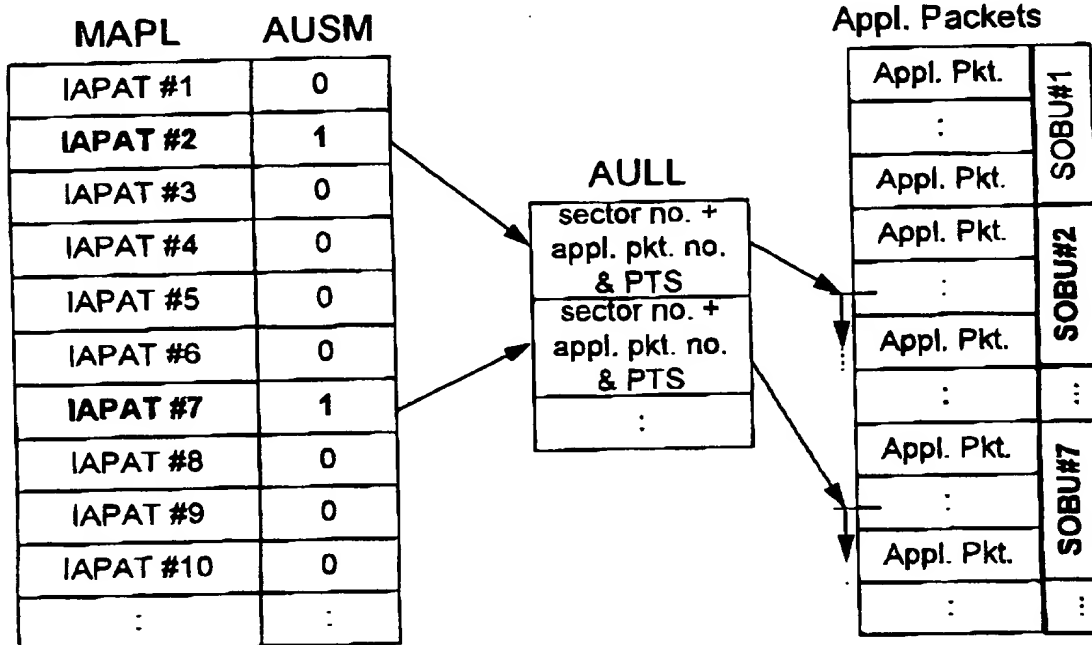
The complete AU information of an SOB consists of either

- the sector & application packet location of the start of the AU and
 - the sector & application packet location of the end of the data which starts at the AU (e.g. the end of the I-frame) and
 - the PTS of the AU
- or
- the start APAT of the AU
 - the end APAT of the AU (e.g. the end of the I-frame) and
 - the PTS of the AU
- or
- the start ATS of the AU
 - the Access Unit End Map (AUEM) of the AU (for the end ATS of the AUs)
 - the end ATS of the AU, based on AUEM, not AUSM and
 - the PTS of the AU

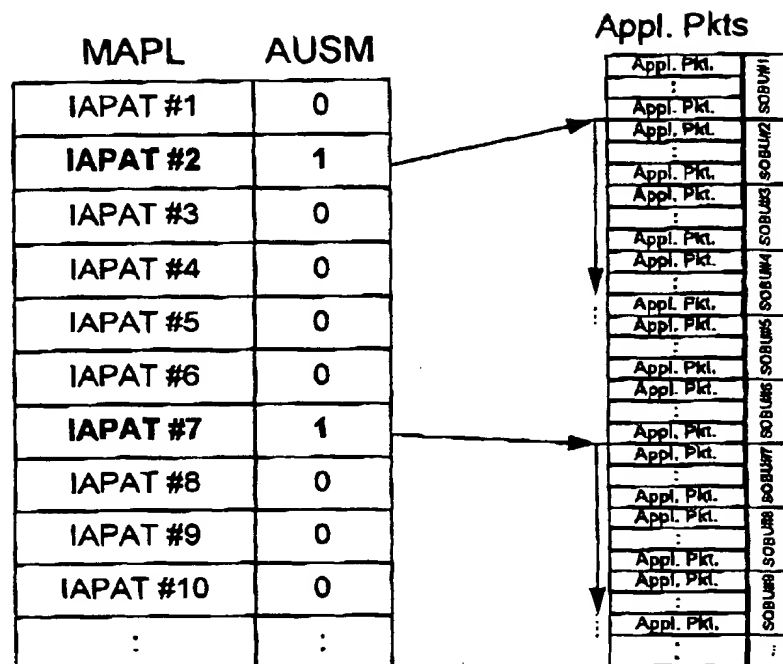
The trickplay (e.g. fast forward) will be performed by selecting the desired AUs (e.g. each second AU) via AUSM/AUEM.

The generating of AUSM, AUEM, AUSLL and AUELL during SOB recording is optional (manufacture matter). The use of AUSM, AUEM, AUSLL and AUELL for trickplay is also optional (manufacture matter). It's mandatory to update the AUSM/AUEM and AUELL in the case of editing.

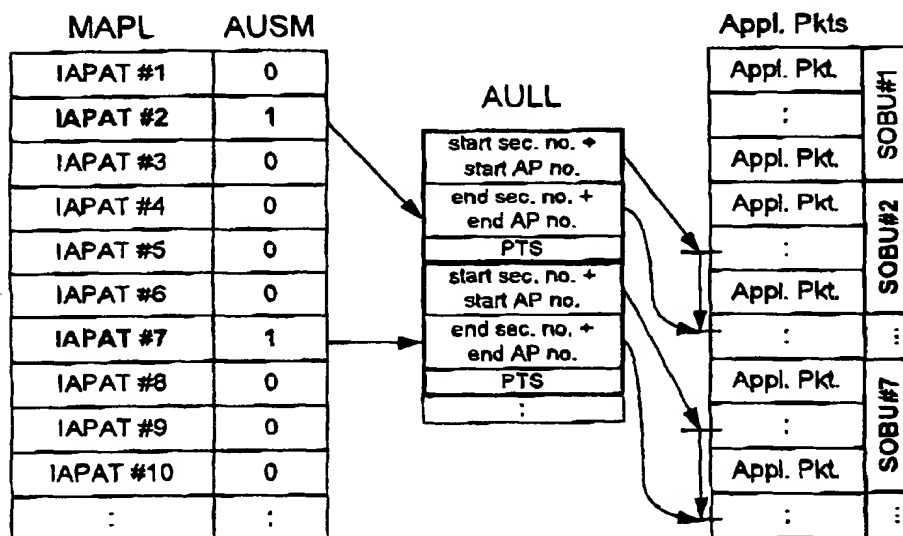
Three examples:



Access via AUSM and AULL



Access via AUSM, but without AULL



AULL also contains end of AU information

Generating of AUSM and AULL

The DVD Streamer specification shall define the syntax of the AUs, not the generating or using of the AUs. However, here are some possible example methods to generate AUSM/AUEM and AULL:

- Method 1:** the application sends after transmission of the stream special data which contains a list of AU as APATs, i.e. each APAT of the list is the

THO's revised Trick Play Support proposal

The DVD Streamer Format Draft Ver 0.3 realizes Trick Play support by the "Entry Point Data" of Section 2.2.3.3.3. THO has now revised this part of the draft to take into account the following outcomings of TG1-3:

- The "Sector based" addressing mechanism has been deleted. This reflects the majority of TG1-3 opinion from the last meeting.
- The wordlength of the "time based" addressing information has been changed from a 6 Byte time value of the APAT type to a 4 Byte time value of the ATS type. As a side effect, a second bit flag array "AUEM" had to be introduced in parallel to the already existing "AUSM". In this new format, the time based address information is not only more compact, but also more directly usable. This is a THO-originated improvement since the last meeting.
- All "Entry Point ..." terms have been renamed to "Access Unit ...", in order to avoid confusion with the user controlled Entry Points in Cell Information, which still exist. This change reflects a desire of TG1-3 to improve naming, and some suggestions thereon.

In the following, the revised Sections of Chapter 2 are given.

2.2.3.3 Stream Object Information (SOBI)

As shown in Figure 2-6, a Stream Object information (SOBI) consists of the Stream Object Information General Information (SOBI_GI), the Mapping List (MAPL) and the Access Unit Data (AUD), if any.

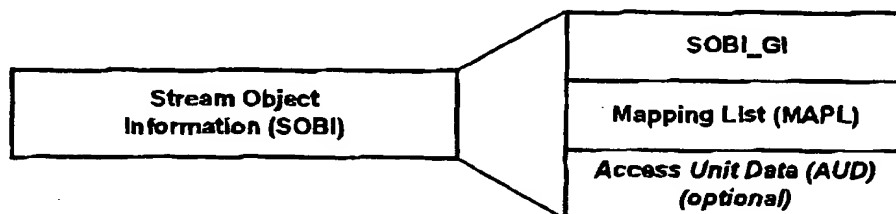


Figure 2-6: Structure of a Stream Object Information

2.2.3.3.1 Stream Object Information General Information (SOBI_GI)

	Contents	Number of Bytes
(1) SOB TY	SOB Type	1
(2) SOB REC TM	SOB Recording Time	5
(3) SOB STI N	SOB Stream Information Number	1
(4) AUD FLAGS	Access Unit Data Flags	1
(5) SOB S APAT	SOB Start APAT	6
(6) SOB E APAT	SOB End APAT	6
(7) SOB S SOBU	first SOBU of this SOB	4
(8) MAPL ENT Ns	number of Mapping List entries	4
Total		28

<...>

(4) AUD_FLAGS

Indicates whether and what kind of Access Unit Data exist for this SOB. If Access Unit Data exist, then AUD_FLAGS also describes several properties of the Access Unit Data. The Access Unit Data itself (described in Section 2.2.3.3.3) consists of the number of Entry Points and the tables AUSM, AUSLL, AUEM, AUELL and PTSLL. The content of AUD_FLAGS is as:

b7	b6	b5	b4	b3	b2	b1	b0
RTAU_FLG	AUD_FLG	AUSLL_FLG	AUEM_FLG	AUELL_FLG	PTSL_FLG	reserved	

- RTAU_FLG** ... 0b: no AU flags exist inside the RT Data of this SOB
 1b: AU flags, as described in Section 3.3.2.2, may exist inside the RT Data of this SOB. This state is even allowed, when no further Access Unit Data exist for this SOB, i.e. when AUD_FLG=0b.
- AUD_FLG** ... 0b: no Access Unit Data exist for this SOB. The bits b5, b4, b3 and b2 of EP_FLAGS shall be set to 0.
 1b: Some Access Unit Data (as further specified by the subsequent flags) exist for this SOB (behind the MAPL).
- AUSLL_FLG** ... 0b: no AUSLL of this SOB exists
 1b: AUSLL of this SOB exists
- AUEM_FLG** ... 0b: no AUEM of this SOB exists. AUELL_FLG must then also be set to 0b.
 1b: AUEM of this SOB exists
- AUELL_FLG** ... 0b: no AUELL of this SOB exists
 1b: AUELL of this SOB exists. Is only allowed when AUEM_FLG = 1b.
- PTSL_FLG** ... 0b: no PTSL of this SOB exists
 1b: PTSL of this SOB exists

<...>

2.2.3.3.3 Access Unit Data

As shown in Figure 2-9, the Access Unit Data (AUD), if any, consists of the Access Unit General Information (AU_GI), the Access Unit Start Location List (AUSLL), the Access Unit End Map (AUEM), the Access Unit End Location List (AUELL) and the Presentation Time Stamp List (PTSL). Which of these parts exist is indicated by AUD_FLAGS of SOBI_GI, see Section 2.2.3.3.1.

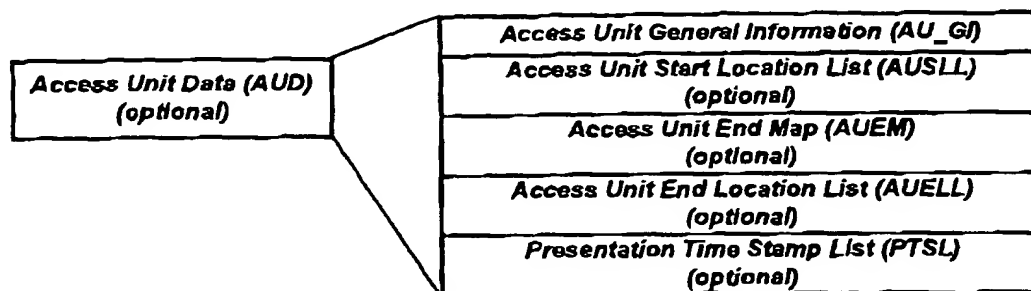


Figure 2-9: Structure of the Access Unit Data

2.2.3.3.3.1 Access Unit General Information (AU_GI)

AU_GI only exists, when AUD_FLAGS of SOBI_GI indicates that Access Unit Data exist.

	Contents	Number of Bytes
(1) AU_Ns	number of Access Units	4
(2) AUSM	Access Unit Start Map (MAPL_ENT_Ns entries)	(MAPL_ENT_Ns+7) div 8
	Total	4+(MAPL_ENT_Ns+7) div 8

(1) AU_Ns

Describes the number of Access Units described for this SOB. At the same time, AU_Ns describes the number of locations, where AUSM indicates the existence of an Access Unit.

(2) AUSM

The Access Unit Start Map indicates which of the SOBUs of this SOB contain Access Units. For each SOBU of the SOB, exactly one AUSM entry exists. So, the AUSM consists of MAPL_ENT_Ns entries. Each AUSM entry indicates an accessible Access Unit somewhere within the corresponding SOBU, or within the subsequent SOBU. Exactly AU_Ns Access Units are indicated by the AUSM, equivalent to exactly AU_Ns bits of AUSM being equal to 1b.

AUSM shall be byte aligned. If the concatenated AUSM entries consists of a number of bits which is not an integer multiple of 8, then the remaining LSBs of the last byte of the AUSM shall be the necessary additional padding bits. These alignment bits shall be set to 0.

Figure 2-10 shows an example of an AUSM and its corresponding SOBUs.

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Note that except for the files described above, the STRREC directory shall not contain any other files or directories.

Stream Data include one or more 'Stream Objects' (SOBs)

- 5 which each can be stored as a 'Program stream' as described in ISO/IEC 13818-1, Systems.

A SOB can be terminated by a `program_end_code`. The value of the SCR field in the first pack of each SOB may be non-zero.

- A SOB contains the Stream Data packed into a sequence of
10 'Stream Packs' (S_PCKs). Stream data can be organised as one elementary stream and are carried in PES packets with a `stream_id`.

- In Stream recording, the application performs its own padding so that the pack length adjustment methods of DVD-ROM
15 Video or RTRW need not to be used. In Stream recording it is safe to assume, that the Stream packets will always have the necessary length.

- The new trick play support proposal is based on the former
20 proposal filed in the European Patent application 99250083.5 of the applicant. Therein, the structure of SOB_GI is described in detail. Most of the components of SOB_GI remain unchanged also in the new proposal and need not be explained in detail here. The information entry (4) EP_FLAGS has been
25 replaced by the information entry (4) AUD_FLAGS explained above. The information item (8) IAPAT_SUM_INIT is deleted from the SOB_GI in the new proposal. The structure of the SOBI also has been revised. Instead of Entry Point Data Access Unit Data is inserted in SOBI. This new type of data
30 and its application is also explained above.

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28.04.1999

Claims

1. Method for implementing trickplay modes in a data stream recorder, and corresponding recorder, wherein access
5 units are added to the bitstream to be recorded and wherein said access units contain items of information like general information, start location list, end location list and presentation time stamp list which are used for the trickplay modes.

10

2. Method or recorder according to claim 1, wherein said trickplay modes include fast forward, fast reverse, slow motion, single picture step and/or still picture.

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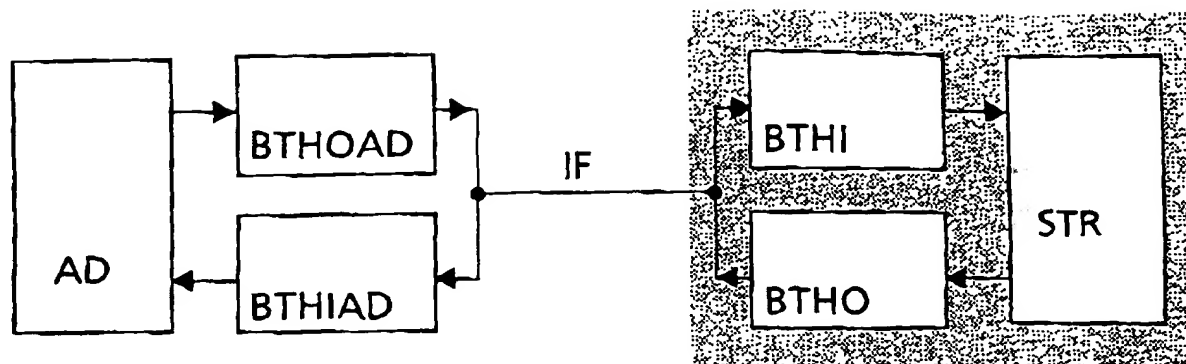


Fig.1

STRD

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